ZOOLOGY.—*Notes on the amphipod* Gammarus minus *Say and description of a new variety,* Gammarus minus *var.* tenuipes. CLARENCE R. SHOEMAKER, U. S. National Museum.[1]

Thomas Say (1818, p. 376) described *Gammarus minus* as follows:

> Eyes reniform; superior antennae longer than the inferior ones, terminal joint with about twelve articulations. Inhabits rivulets and small fresh-water streams. Body whitish, with a few very pale fulvous lateral spots; eyes blackish, placed at the exterior base of the superior antenna; superior antennae obviously longer than the inferior ones, seta short, attaining the tip of the second articulation of the terminal joint, terminal joint with about twelve articulations. Length three-twentieths of an inch. Found in brooks under stones, and may be readily discovered by taking a stone out of the water, and inspecting its inferior surface.

His description would be quite inadequate for the recognition of the species, except for his mentioning that the first antennae are obviously longer than the second and that it inhabits rivulets and small fresh-water streams. It is, as he states, an inhabitant of the small streams, and, though he does not say streams of the east coast, he undoubtedly means such, as all the other amphipods he described were from the east coast. It is a very common and widely distributed species of the cold streams of the eastern section of the United States, in contradistinction to *Gammarus fasciatus* Say, which inhabits the warmer waters of our eastern rivers.

Though *Gammarus minus* is so common and widely distributed, there have been comparatively few references to it in literature since its discovery in 1818. H. Milne Edwards (1840, p. 46) says that the species described by Say under the name of *Gammarus minus* does not seem to differ in any important character from *G. fasciatus* and it will perhaps be necessary to unite them. A. A. Gould (1841, p. 334) says, "Found [in Mass.] in ditches and sluggish fresh water, adhering to sticks." Since the habitat he cites does not seem suitable for *G. minus,* it is doubtful whether his reference applies to this species. J. E. DeKay (1844, p. 37) says, "This species is common [in New York] in most of our fresh-water streams, and may often be detected under stones and pieces of wood. It is extremely active, and is popularly known under the name of *Fresh-water Shrimp.*" He gives a short description, but fails to add any useful characters, and he also gives a very small inaccurate figure. Adam White (1847, p. 88), in his *List of the specimens of Crustacea in the collection of the British Museum,*

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uses the name *Gammarus minimus* Say and gives the locality as United States; specimens presented by Thomas Say. Spence Bate (1862, p. 221), in *Catalogue of the specimens of amphipodous crustaceans in the collection of the British Museum*, repeats Say's description and habitat.

Sidney I. Smith (1874, p. 654) says, "I have not yet been able to rediscover this species, which is very likely not a true *Gammarus*." He believes that the specimens referred to by White and Bate were the ones that Bate described as *Allorchestes knickerbockeri* (1862, p. 36). Lucien M. Underwood (1886, p. 357) mentions the species as occurring doubtfully in New York. Thomas R. R. Stebbing (1906, p. 513) puts *G. minus* in the list "Gammari nominatim, reapse incertae sedis." Henry W. Fowler (1912, p. 194) in *The Crustacea of New Jersey*, lists *Gammarus minus* Say and questionably *Lepleurus rivularis* Rafinesque as synonyms of *Gammarus fasciatus* Say. From the localities he cites for *G. fasciatus* it is quite evident that he is dealing with both *G. fasciatus* and *G. minus*.

As the references to *Gammarus minus* in literature add nothing to Say's inadequate diagnosis, I here redescribe and figure the species from specimens collected by John W. Price from a small stream at Gable's Woods, Lancaster, Pa., on March 6, 1936. As Say did not designate any locality, a male from this lot has been selected as the neotype, U.S.N.M. no. 79152. I have selected this locality for the neotype because Say collected *G. fasciatus* at Philadelphia, and it is probable that he also collected *G. minus* in the brooks of the surrounding country, which would be only about 60 miles from Lancaster.

Gammarus minus is placed by Dr. A. Schellenberg (1937, p. 270) in the subgenus *Rivulogammarus*, which he established for those almost exclusively fresh-water species of the cold and temperate regions of the northern half of the earth. He characterized this subgenus as having the side lobes of the head truncate or rounded off without the sharp upper corner. Eyes mostly small, oval or kidney-shaped. First and second urosome segments without or with only weakly developed central humps and with only one pair of central spines. Third urosome segment mostly without central spines. A part of the urosome spines sometimes replaced by bristles. Accessory flagellum 1- to 6-jointed. Lower margin of the coxal plates mostly unbristled. Metacarpus of the first gnathopod of male with peglike spines on rear margin. Rami of the third uropod varied in length, but the inner ramus never reduced to a scalelike joint.

Gammarus (Rivulogammarus) minus Say Figs. 1, 2

Gammarus minus Say, Journ. Acad. Nat. Sci. Philadelphia 1(2): 376. 1818.
G. propinquus Hay, Proc. U. S. Nat. Mus. 25(1285): 224. 1902.
G. purpurascens Hay, Proc. U. S. Nat. Mus. 25(1292): 433, fig. 7. 1902.

Male.—Head with lateral lobes squarely truncate, upper and lower angles of lobes rounding. Eyes large, black, reniform, and slightly broader below. Antenna 1 about two-thirds the length of the body and considerably longer than antenna 2; first joint of peduncle a little longer than second, which is about twice as long as third; flagellum of about 30 joints; accessory flagellum of three or four long joints and a very minute terminal joint. Antenna 2, gland cone of second joint prominent; third joint prominent; fourth and fifth joints about equal in length; flagellum nearly as long as fourth and fifth joints combined and consisting of about 14 joints, the first five or six of which bear calceoli.

Right mandible with cutting edge rather narrow and armed with four teeth; accessory plate with double cutting edge; five spines in spine row; molar strong and bearing two short plumose setae on front margin and a long seta on inner margin; second joint of palp slightly longer than the third. Inner plate of maxilla 1 with about 16 plumose setae; outer plate with 11 spine teeth, some of which are blunt and some pectinate; palp of right maxilla broad, armed distally with four or five stout teeth, one slender pectinate spine tooth, and one slender plumose seta; palp of left maxilla with about seven slender spine teeth and four slender setae. Maxilla 2 normal and bearing the usual oblique row of plumose setae on inner plate. Maxillipeds with inner plate narrower, but nearly as long as outer plate, bearing distally three spine teeth and numerous slender curved plumose spines, inner margin bearing long, slender, plumose setae and one short spine near the upper angle; outer plate armed with a row of spine teeth on distal inner margin, a row of curved plumose setae on distal margin and numerous submarginal setae near the inner margin; palp rather short and stout, third joint with a low distal lobe, the inner edge of which extends obliquely across the inner face of the joint bearing a row of serate spinules; fourth joint rather slender and armed distally with a fine nail at the base of which are several closely set setules. Lower lip with broad blunt side lobes.

Coxal plates 1 to 3 bearing a few spinules at the rounding anterior and posterior corners. Coxal plate 4 bearing a few setules at anterior corner and a row on the lower posterior margin. Sixth joint of gnathopod 1 with the very oblique palm bearing a stout central spine and a stout defining spine, hind margin and inner surface of joint bearing several short blunt spines. Sixth joint of gnathopod 2 with front and hind margins about parallel, the oblique palm bearing a stout central spine and two stout spines at the broadly rounding defining angle, inner surface of joint bearing two small submarginal spines at defining angle. Peraeopods 1 and 2 very similar in structure, but 1 the longer and stouter and bearing longer and more numerous bristles. Second joint of peraeopod 3 broad, with the lower hind margin forming a prominent angle. Peraeopods 4 and 5 about equal in length, second joint with distinct lower hind angle.

Metasome segments 2 and 3 with lower hind corners sharply produced, lower margins bearing spinules and hind margins setae. Urosome segments 1 and 2 somewhat raised dorsally, and each bearing the two median dorsal spines characteristic of the subgenus *Rivulogammarus*. Urosome segment 3 may have either one or two median dorsal spines, or it may be without any,

but there are always median setae. Urosome segments 1 to 3 may bear either one or two lateral spines on either side. All urosome spines are accompanied by setae or bristles.

The number of spines on uropods 1 and 2 varies with the size of the specimen, but the number is always small. Uropod 3 with inner ramus about two-thirds the length of the outer, and both rami furnished on their margins with fascicles of long setae. Outer ramus without plumose setae on the second joint or apex of first joint; outer margin of first joint with a plumose seta in each fascicle except those which contain spines; inner margin with a plumose seta in each fascicle. Inner ramus without plumose setae on apex, but outer and inner margins with a plumose seta in each fascicle.

The telson varies somewhat in different individuals; the general arrangement being a single lateral spine accompanied by several setae, three apical spines with long setae on each lobe, and a group of lateral setae near the apex of each lobe. Occasionally there is an extra lateral spine either above or below the regular lateral spine. Length of the largest males about 16 mm.

Female.—The gnathopods are smaller than in the male, and the fifth and sixth joints of gnathopod 2 are much narrower and are about equal in length. Antenna 2 bears no calceoli. Uropod 3 shorter than in the male.

Remarks.—There are in the National Museum females of *Gammarus minus* from the District of Columbia carrying eggs each month from January to August. There are hatched young in the marsupium in January, April, May, June, and August. Free-swimming young are found in January, April, July, and August collections. There are no specimens taken in the District of Columbia from September to December, but specimens from Virginia and Pennsylvania taken in November and December carry eggs. It appears, therefore, from these records that the species breeds throughout the year.

Specimens of *G. minus* from a cave at Speed Creek, about 8 miles northeast of Bedford, Lawrence County, Ind., and those from a cave on the Mullindore property, Rohrersville, Washington County, Md., differ very slightly from the normal surface water form.

In the National Museum there are collections of *G. minus* from Pennsylvania, Maryland, District of Columbia, Virginia, West Virginia, Indiana, Tennessee, Kentucky, and Georgia.

I have examined the type material of *Gammarus propinquus* Hay from a spring about 2 miles north of Mammoth Cave, Ky., and of *G. purpurascens* Hay taken at the mouth of Nickajack Cave, Shellmound, Tenn., and I find that they do not differ specifically from *G. minus* Say. Hay does not give the measurements of either species, but the largest specimens of *G. propinquus* are about 10.5 mm from the front of the head to the tip of the third uropods, and those of *G. purpurascens* are about 10 mm. The specimens collected by Hay in spring at Rossville, Ga. (referred to in Proc. U. S. Nat. Mus. **25**: 434. 1902) and identified as *G. purpurascens*, are in the National Museum. They are all of medium size, the largest about 9 mm and are undoubtedly *G. minus* Say.

The *Lepleurus rivularis* of Rafinesque (1820, p. 7) said to occur in the brooks of the mountains of Pennsylvania and at Shannon Run and Bedford

Springs, Va., is probably the *Gammarus minus* of Say, but Rafinesque's description is so imperfect that nothing can be learned from it.

Gammarus minus var. tenuipes, new variety

Specimens from Organ Cave, Greenbrier County, W. Va., found in a stream a quarter of a mile in from the entrance, appear to be a subterranean variety of *Gammarus minus.* These specimens have the eye greatly reduced and occasionally almost entirely lacking. The lateral lobes of the head have the corners very rounding. The gnathopods and peraeopods are slender, especially noticeable in the narrowing of the second joint of the last three peraeopods. In some of the specimens there is a reduction in the number of spines on the urosome. The inner ramus of the third uropod is proportionately longer than in the normal form. The whole animal has a weaker and more delicate appearance than the surface form. Length about 14 mm.

The type, a male, U.S.N.M. no. 79195, was taken in Organ Cave, Greenbrier County, W. Va., on October 21, 1939, by T. Kenneth Ellis.

The National Museum has also a specimen of this variety from McClung's Cave, West Virginia, and several from Higgenbotham's Cave, Frankford, Greenbrier County, W. Va., collected by J. M. Valentine.

LITERATURE CITED

Bate, C. Spence. *Catalogue of the specimens of amphipodous Crustacea in the collection of the British Museum.* Pp. 1–399, pls. 1–58. London, 1862.

DeKay, J. E. *Natural history of New York, or the New York fauna. Part 6: Crustacea.* Pp. 1–70, pls. 1–13. 1844.

Fowler H. W. *Crustacea of New Jersey.* Ann. Rep. New Jersey State Mus. for 1911: 35–461, pls. 1–150. 1912.

Gould, A. A. *Report on the Invertebrata of Massachusetts. Crustacea.* Pp. 11–23; 321–341. 1841.

Hay W. P. *Observations on the crustacean fauna of the region about Mammoth Cave Kentucky.* Proc. U. S. Nat. Mus. **25** (1285): 223–236. 1902.

—— *Observations on the crustacean fauna of Nickajack Cave, Tennessee, and vicinity.* Proc. U. S. Nat. Mus. **25** (1292): 417–439 figs. 1–8. 1902.

Milne-Edwards H. Histoire naturelle des crustacés, **3**: 1–638. 1840.

Rafinesque C. S. *Annals of nature or Annual synopsis of new genera and species of animals, plants, etc., discovered in North America.* First Annual Number, for 1820: 1–16. 1820.

Say, Thomas. *An account of the Crustacea of the United States.* Journ. Acad. Nat. Sci. Philadelphia **1**: 374–457. 1818.

Schellenberg, A. *Schlüssel und Diagnosen der dem Süsswasser-*Gammarus *nahestehenden Einheiten ausschliesslich der Arten des Baikalsees und Australiens.* Zool. Anz. **117**: 267–280. 1937.

Smith, S. I. *The Crustacea of the fresh waters of the United States.* Report of the United States Commissioner of Fisheries for 1872 and 1873, pt. 2: 637–709, pls. 1–3. 1874.

Stebbing, T. R. R. *Amphipoda I Gammaridea.* Das Tierreich, pp. i–xxxix; 1–806. 1906.

Underwood, L. M. *List of the described species of fresh water Crustacea from America, north of Mexico, Article V.* Bull. Illinois State Lab. Nat. Hist. **2**: 323–386. 1886.

White, Adam. *List of the specimens of Crustacea in the collection of the British Museum.* Pp. i–viii; 1–143. 1847.

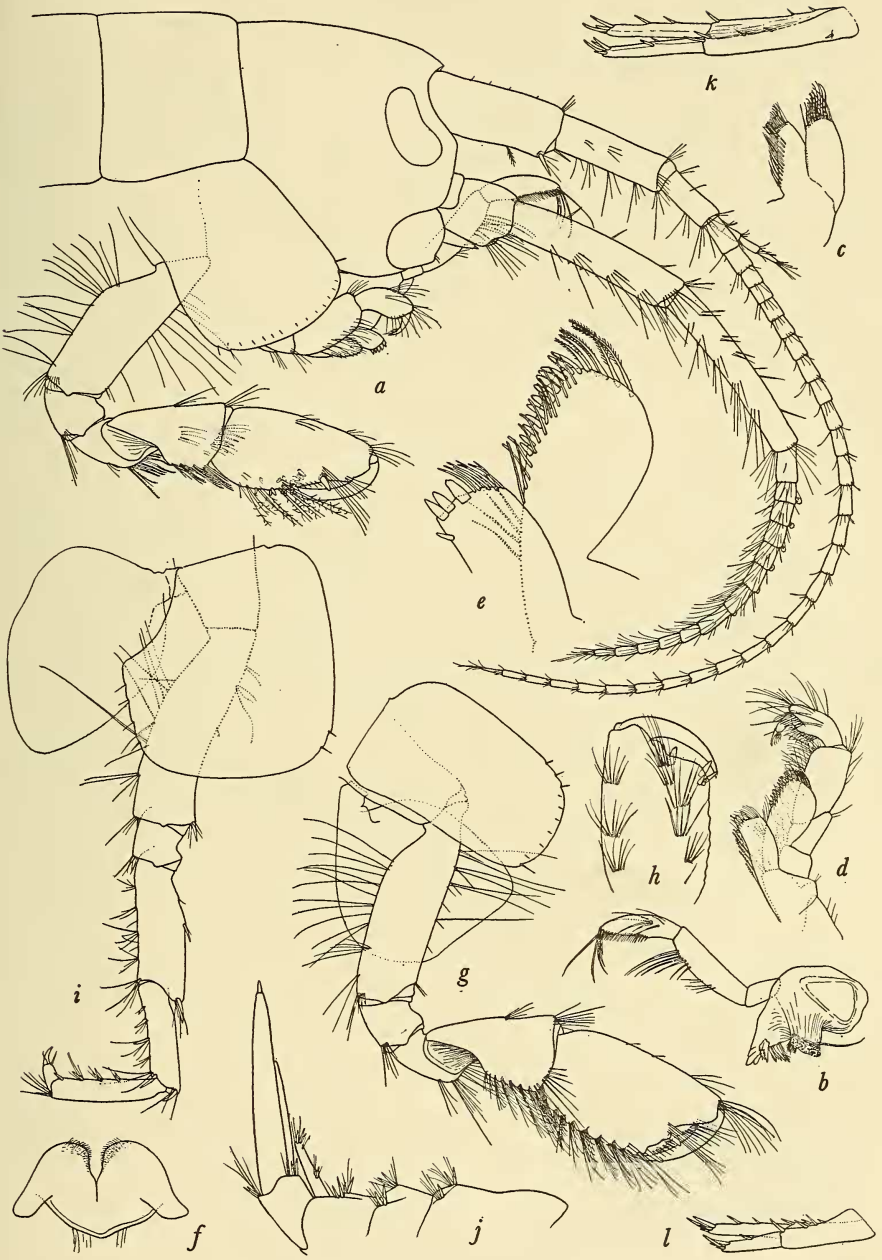

Fig. 1.—*Gammarus minus* Say, male: *a*, Anterior end of animal; *b*, right mandible; *c*, maxilla 2; *d*, right maxilliped; *e*, inner and outer plates of maxilliped on larger scale; *f*, lower lip; *g*, gnathopod 2; *h*, inner surface of metacarpus of gnathopod 2; *i*, peraeopod 2; *j*, urosome; *k*, uropod 1; *l*, uropod 2.

Fig. 2.—*Gammarus minus* Say, male: *a*, Right maxilla 1; *b*, palp of maxilla 1 on larger scale; *c*, palp of another male showing five spine teeth; *d*, left palp showing terminal spines; *e*, distal end of outer plate of maxilla 1 showing the 11 spine teeth; *f*, peraeopod 1; *g*, peraeopod 3; *h*, peraeopod 4; *i*, peraeopod 5; *j*, metasome; *k*, uropod 3; *l*, *m*, apex of outer and inner rami of uropod 3 on larger scale; *n*, telson; *o*, telson of another male. The figures of telson are on a slightly larger scale than the uropods.